State of New Mexico Nutrient Narrative Criterion Assessment Method

Background

The State of New Mexico narrative criterion to determine nutrient impairment states,

> "Plant nutrients from other than natural causes shall not be present in concentrations which will produce undesirable aquatic life or result in a dominance of nuisance species in surface waters of the state" (NMAC 2005).

The narrative nutrient criterion can be challenging to assess as the relationships between nutrient levels and impairment of designated uses are not well defined, and distinguishing nutrients from "other than natural causes" is difficult. As part of the § 303(d) assessment methodology, the New Mexico Surface Water Quality Bureau (SWQB) uses a weight-of-evidence approach to conduct a more robust assessment and to account for diverse systems and dynamic nutrient cycling. In this approach, both cause (TN and TP) and response variables (e.g., DO, pH, chlorophyll *a*, etc.) are evaluated to determine impairment. While § 303(d) assessment methodology for nutrients is public noticed as part of states' public participation process, the state hasn't codified into regulation the assessment methodology for nutrients nor any part of the assessment methodology.

If a stream reach is determined to be impaired based on the nutrient assessment protocol, Total maximum Daily Load (TMDL) development must be scheduled. If there are NPDES permittees discharging into the impaired receiving water, the TMDL will generally be written to address both TN and TP because many receiving streams in New Mexico are co-limiting, meaning that overall loads of both TN and TP must be reduced to adequately address nutrient impairment. If SWQB has evidence that only one nutrient is causing the impairment, the TMDL will focus on that particular nutrient.

Method Description

A two-tiered approach to nutrient assessment is utilized for streams mainly because the large number of stream segments in New Mexico and the need to prioritize data collection efforts and resources. The two levels of assessment are used in sequential order to determine if there is excessive nutrient enrichment. The Level I assessment is a screening level assessment that is more qualitative and based on a review of available data, including on-site qualitative observations (e.g. percent algal cover) and in-stream quantitative measurements (e.g. TN and TP concentrations). If a Level I assessment indicates potential nutrient enrichment, a Level II assessment is used to provide a quantitative evaluation. The Level II assessment is based on measurements exceeding both the numeric nutrient threshold values and indicators of excessive primary production (i.e., large dissolved oxygen (DO) and pH fluctuation, and/or high

chlorophyll *a* concentration) that demonstrate an unhealthy biological community. If and only if both occur is the reach considered to be impaired.

Level I assessments are conducted at each water quality station; however, if a stream reach was previously listed as impaired for nutrients, a Level II assessment must be performed. Both the Level I and Level II assessments use a weight-of-evidence approach that evaluates various conditions in the stream and utilizes both stressor (nitrogen and phosphorus) and response (DO, pH, algal biomass) variables in order to conduct a more robust assessment and account for diverse lotic systems and dynamic nutrient cycling.

The following indicators are used in assessment:

1. Level I Observations
   a. Percent algae coverage
   b. Periphyton growth (thickness)
   c. Presence of anoxic layer

2. Level I Measurements
   a. Dissolved oxygen (% saturation) and pH
   b. TN and TP concentrations

3. Level II Measurements
   a. Continuous dissolved oxygen and pH datasets (sonde data)
   b. Dissolved oxygen and pH grab data
   c. TN and TP concentrations
   d. Periphyton chlorophyll *a* (µg/cm2)

Dissolved oxygen and pH thresholds are based on designated uses of an assessment unit, as indicated in § 20.6.4.900 of the *State of New Mexico Standards for Interstate and Intrastate Surface Waters* (NMWQCC 2011). TN and TP thresholds are based on New Mexico's nutrient criteria development process as discussed in the *Analysis of Information and Data* section, *Nutrient Assessment Protocol for Wadeable Perennial Streams*.

For chlorophyll *a*, the 90th to 99th percentile of data from best available sites was used to calculate impairment thresholds for each ecoregion (**Table 1**). If a sample falls within the ranges presented in Table 1, SWQB will list the Assessment Unit under category "5C – Additional information needed before scheduling TMDL development." The listing will be changed to Not Supporting (Category 5A) if a second chlorophyll *a* sample within a 5-year period confirms the impairment.

Table 1. Chlorophyll *a* Level III Ecoregional Threshold Values in µg/cm^2

21-Southern Rockies	20/22-AZ/NM Plateau	23-AZ/NM Mountains	24/79-Chihuahuan Desert	25/26-SW Tablelands
3.9 – 5.5	7.4 – 7.8	5.8 – 11.0	16.5 – 17.5	8.2 – 14.0

Note: Since the number of samples used to calculate the thresholds is relatively small for each ecoregion, the 90th to 99th percentile range is used for threshold values.

For most streams, indicators are compared to thresholds values derived from water quality standards, SWQB analyses, or published literature. However, if the assessor feels that the established thresholds are not appropriate for the class of stream being assessed, a reference site approach may be used. A suitable reference reach will be surveyed and indicators from the study reach will be compared to those of the reference reach rather than the established thresholds. This is to account for streams that may have naturally high productivity because of regional geology, flow regime, or other natural causes. For more information on the assessment process, please refer to *Nutrient Assessment Protocol for Wadeable Perennial Streams* (NMED/SWQB 2011; Appendix D).